

On-Site Rollover Investigation
Dynamic Science, Inc. (DSI), Case Number DS10006
2010 Ford Fusion
California
February 2010

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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points be coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

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16. Abstract This on-site investigation focused on a 2010 Ford Fusion that was involved in a frontal impact and subsequent rollover. This single vehicle crash occurred in February 2010 at 2120 hours in an unincorporated area of California. The crash site was the four-leg intersection of a north/south roadway and an east/west roadway. The subject vehicle was being driven south in the wrong direction in the northbound travel lanes approaching the intersection by a 48-year-old male. The Ford crossed through the intersection, impacted a concrete/gravel embankment, vaulted, and overturned end-over-end. The Ford came to rest on its roof facing north. The driver exited the vehicle under his own power and was transported to a local hospital where he was treated and released. The subject vehicle's Event Data Recorder (EDR) was supported by the Bosch Crash Data Retrieval (CDR) tool and the crash data was imaged during the vehicle inspection. The imaged EDR report is included as Attachment 2 at the end of this report. This is a truncated copy of the report that is devoid of hexadecimal data.				
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Crash Investigation
Case Number: DS10006

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BACKGROUND

This on-site investigation focused on a 2010 Ford Fusion that was involved in a frontal impact and subsequent rollover (**Figure 1**). This single vehicle crash occurred in February 2010 at 2120 hours in an unincorporated area of California. The crash site was the four-leg intersection of a north/south roadway and an east/west roadway. The subject vehicle was being driven south in the wrong direction in the northbound travel lanes approaching the intersection by a 48-year-old male. The Ford crossed through the intersection, impacted a concrete/sand embankment, vaulted, and overturned end-over-end. The Ford came to rest on its roof facing north. The driver sustained minor head and leg injuries. He exited the vehicle under his own power and was transported to a local hospital for treatment.



Figure 1. Subject vehicle, 2010 Ford Fusion

This on-site rollover investigation was identified by a DSI investigator during a review of an auto auction internet site. Photographs of the subject vehicle were submitted to the National Highway Traffic Safety Administration (NHTSA) and on February 19, 2010 DSI was directed to commence the investigation. The police report for this crash was obtained. Permission to inspect the vehicle was granted and the vehicle inspection was completed on March 4, 2010. Field work was completed on March 8, 2010.

The subject vehicle's Event Data Recorder (EDR) was supported by the Bosch Crash Data Retrieval (CDR) tool version 3.4 and the crash data was imaged during the vehicle inspection. The imaged EDR report is included as Attachment 2 at the end of this report. This is a truncated copy of the report that is devoid of hexadecimal data.

SUMMARY

Crash Site

The approach to the crash site was the intersection of a north/south roadway and an east/west roadway. The north leg of the intersection was configured with a right turn lane, a southbound through lane, a left turn lane, a raised median, and two northbound travel lanes. The asphalt roadway was straight and dry. At the intersection, the roadway was illuminated by streetlights. Stop signs were present for southbound traffic at the northwest corner of the intersection and on the center median. The weather was clear and visibility in all directions was good. The posted



Figure 2. Southbound approach, 76.2 m (250 ft) from point of impact

speed limit for this roadway was 72 km/h (45 mph). The Ford was traveling south in the northbound travel lanes (**Figure 2**).

South of the southern edge of the east/west roadway there was a gravel shoulder and an approximately 4.5 m (15 ft) wide area of rough concrete that descended from north to south negative 7.4 percent. South of this area was a concrete/gravel embankment (**Figure 3**). The embankment was oriented in a north/south direction. The concrete portion was on the northern end of the embankment and was approximately 6.0 m (20.0 ft) in length. The northern end was 1.2 m (4.0 ft) wide and tapered until it was 2.7 m (9.0 ft) wide. The leading edge had an ascending angle of 25 degrees; the right side had an angle of 34 degrees and the left side had an angle of 20 degrees. The leading edge was 0.6 m (2.0 ft) high and ascended to approximately 1.2 m (4.0 ft) in height. South of the concrete embankment there was 8.2 m (27.0 ft) gravel embankment that was oriented in the same direction as the concrete embankment. To the right of the embankment, was a 6.0 m (20.0 ft) gravel covered roadway. Trees were planted parallel to this roadway. Approximately 54.8 m (180.0 ft) south of the east/west roadway there was an east/west oriented private driveway that measured 4.6 m (15.0 ft) in width.



Figure 3. Embankment

Pre-Crash

The Ford was traveling southbound in the northbound travel lanes at an EDR-reported speed of 105.0 km/h (65.2 mph) at five seconds prior to algorithm enable (AE). The driver reported that he been drinking and had passed out. He had no memory of the crash. The Ford crossed through the intersection and approximately 39.0 m (128.0 ft) from impact the driver began braking. The Ford departed the east/west roadway along the southern edge and traveled straight toward the embankment. At impact, the EDR reported a vehicle speed of 28.0 km/h (17.4 mph).

Crash

The front of the Ford struck the concrete embankment (Event 1). The impact resulted in sufficient longitudinal deceleration of the Ford to command the deployment of the driver's steering wheel mounted frontal air bag and actuated the driver's safety belt pretensioner.

The EDR recorded the maximum longitudinal Delta-V as -35.73 km/h (-22.26 mph) at 250 milliseconds and the maximum lateral Delta-V as 10.35 km/h (6.43 mph) at 138 msec. The Damage Only algorithm of the WinSMASH program



Figure 4. Contact with tree during rollover

computed the Total Delta-V of 36.0 (22.3 mph); the longitudinal and lateral components were -35.5 km/h (-22.0 mph) and 6.3 km/h (3.9 mph), respectively. The results appear reasonable based on the crush profile.

The vehicle traveled over the embankment, vaulted, and began an end-over-end rollover about its lateral axis (Event 2). The vehicle first impacted the ground with its front end; a gouge was located 22.5 m (74.0 ft) south of the initial impact. The vehicle then impacted the ground with its back end; a gouge was located 24.7 m (81.0 ft) south of the initial impact. Adjacent to the gouge was a small tree with contact damage that matched up with the left rear of the Ford (Event 3) (**Figure 4**). The vehicle continued the end-over-end rollover three more quarter turns before coming to rest on its roof near the private roadway (**Figure 5**). The right side of the vehicle sustained minor scratches from contact with the trees to the right (Event 4). During the rollover the left and right inflatable curtain (IC) air bags and the driver's seat-mounted air bag deployed.



Figure 5. Area of final rest, looking north

Post-Crash

The driver of the Ford was able to exit the vehicle under his own power. He sustained a concussive head injury and a laceration to his right leg. He was transported from the scene to a local hospital where he was treated and released. At some point he was arrested for operating a motor vehicle while being under the influence of alcohol. The Ford was towed from the scene due to damage and was later declared a total loss by the insurance company.

Vehicle Data - 2010 Ford Fusion

The 2010 Ford Fusion SE was identified by the Vehicle Identification Number (VIN): 3FAHP0HAXARxxxxxx. The vehicle date of manufacture was November 2009. The vehicle was equipped with a 2.5-liter, 4-cylinder engine, automatic transmission, traction control, 4-wheel disc brakes with ABS, front wheel drive, and power steering with tilt functionality. The vehicle manufacturer's recommend tire size was P225/45R18. The recommended cold tire pressure was 241 kPa (35 psi). The Ford was configured with Goodyear Eagle RS-A P225/45R18 tires. The tire manufacturer's recommended maximum tire pressure was 352 kPa (51 psi). The specific tire information is as follows:

Position	Measured Pressure	Measured Tread Depth	Restricted	Damage
LF	241 kPa (35 psi)	10 mm (13/32 in)	No	None
LR	Tire Flat	10 mm (12/32 in)	No	Cut in sidewall
RR	159 kPa (23 psi)	10 mm (13/32 in)	Yes	None
RF	Tire Flat	9 mm (11/32 in)	Yes	De-beaded. Rim fractured.

The seating in the Ford was configured with front bucket seats with adjustable head restraints and 60/40 split bench rear seats with adjustable head restraints.

Vehicle Damage

Exterior Damage

The Ford sustained moderate front end damage from the impact with the embankment (**Figure 6**). The direct damage began at the front left backing bar corner and extended 114.0 cm (44.8 in) to the right. The bumper fascia was displaced from the vehicle during the crash and there was 150.0 cm (59.0 in) of direct contact to the fascia. Six crush measurements were documented at the backing bar as follows: $C_1 = 24.0$ cm (14.9 in), $C_2 = 21.0$ cm (13.0 in), $C_3 = 22.0$ cm (13.7 in), $C_4 = 21.0$ cm (13.0 in), $C_5 = 18.0$ cm (7.0 in), $C_6 = 19.0$ cm (11.8 in). The backing bar was rotated downward and the crush measurements were taken to the middle of the backing bar face. The maximum crush was located at C_1 . The Collision Deformation Classification (CDC) for the frontal impact with the embankment was 12FDEW2.



Figure 6. Front of subject vehicle with contour gauge in place, 2010 Ford Fusion

The Ford sustained moderate damage to the roof and back plane as a result of the rollover. The direct damage to the top extended from roof side rail to roof; it began 108.0 cm (42.5 in) forward of the rear axle and extended forward 247.0 cm (97.2 in) to include the entire hood. The maximum vertical crush was located 22.0 cm (8.7 in) aft of the windshield header, 41.0 cm (16.1 in) left of the right

roof rail, and measured 3.0 cm (1.2 in) (**Figure 7**). The CDC for the rollover was 00TDDO2. The direct damage to the back extended from bumper corner to bumper corner and included the trunk deck. The bumper fascia and spoiler had been displaced.

Light scratching was located to the right side of the vehicle beginning 80.0 cm (31.4 in) aft of the rear axle and extending forward 300.0 cm (118.1 in). This was caused by contact to tree branches during the rollover. The CDC for this contact 00RDAS2. There was also a wood bark contact above the left rear wheel well. The CDC for this contact was 00LBMS1.

Interior Damage

The Ford sustained moderate interior damage as a result of passenger compartment intrusion and occupant contacts. The vehicle sustained vertical intrusions to the windshield header and the roof, and longitudinal intrusions to C-pillar area and the second row seat back. The right rear door was jammed shut and the other doors remained closed and operational. There was integrity loss to the glazing at the left front, right front, left rear, right rear, and backlight locations. The windshield was cracked from the rollover but remained intact. There were possible occupant contacts to the left instrument panel to and to the roof. The scuff contact to the instrument panel was located along the lower edge and began 17.0 cm (6.7 in) to the right of the left aspect. There were three possible roof contacts (**Figure 8**). The first was located 5.0 cm (1.9 in) left of the centerline and 45.0 cm (17.7 in) rearward of the windshield header; it measured 5.0 cm (1.9 in) in width and was 8.0 cm (3.1 in) in length. The second was located 10.0 cm (3.9 in) left of the centerline and 55.0 cm (21.6 in) rearward of the windshield header; it was 12.0 cm (4.7 in) in width and 19.0 cm (7.5 in) in length. The third was 11.0 cm (4.3 in) in length and was located 38.0 cm (14.9 in) left of the centerline and 30.0 cm (11.8 in) rearward of the windshield header. The contacts may have been caused as the driver exited the vehicle.

Manual Restraints

The Ford was equipped with 3-point manual lap and shoulder belts for each of the five seating positions. The front safety belts were configured with adjustable D-ring anchorages; both front seat belt anchorages were in the full-up position. The driver's safety belt was configured with a sliding latch plate and an Emergency Locking Retractor (ELR). The remaining outboard safety belts were



Figure 7. Maximum vertical crush, 2010 Ford Fusion



Figure 8. Possible roof contacts

configured with sliding latch plates and switchable ELR/Automatic Locking Retractors (ALR). The driver's and front right occupant's safety belts exhibited evidence of historical usage in the form of scratches on the latch plates. The driver's belt exhibited evidence of occupant loading in the form of scuffing to the seat belt webbing at the D-ring. The scuff measured 4.0 cm (1.6 in) and was located 155.0 cm (61.0 in) from the anchor.

Supplemental Restraint Systems

The 2010 Ford Fusion was equipped with a Certified Advanced 208-Compliant (CAC) frontal air bag system, front seat back mounted side air bags, side impact/rollover combination left and right inflatable curtain (IC) air bags located in the right and left roof side rails. The manufacturer of the Ford has certified that the vehicle is compliant with the advanced air bag portion of Federal Motor Vehicle Safety Standard (FMVSS) No. 208. The CAC system includes dual-stage frontal air bags for the driver and front passenger positions, seat track positioning sensors, and retractor pretensioners. The driver's air bag, driver's seat-mounted side air bag, and both IC air bags deployed.

The driver's air bag deployed from the center of the steering wheel hub through H-configuration module cover flaps (**Figure 9**). The top flap measured 18.0 cm (7.0 in) in width and 8.0 cm (3.1 in) in height; the lower flap measured 18.0 cm (7.0 in) in width and 11.0 cm (4.3 in) in height. The deployed air bag measured 50.0 cm (19.7 in) in width in its deflated state. The air bag was tethered by a single internal strap. The tether was attached to a stitched 15.0 cm (5.9 in) diameter circle in the center of the front panel. Two X-shaped vent ports that measured 4.0 cm (1.6 in) were located at the 11 and 1 o'clock aspects on the rear panel. The air bag and module covers were not damaged. There were areas of grease and dirt located on the left upper and lower quadrants of the air bag face.

The driver's seat-mounted side air bag deployed from the triangular shaped module cover on the side of the seat back (**Figure 10**). The deployed air bag was semi-circular in shape and measured 29.0



Figure 9. Driver's frontal air bag



Figure 10. Contact to inboard aspect of side air bag



Figure 11. Left IC air bag (front cut away)

cm (11.4 in) in length and 24.0 cm (9.4 in) in height. There was a single vent port on the outboard panel. A small green scuff was located on the inboard panel. The side IC air bags deployed through the roof rail cladding from a module located at the roof side rail (**Figure 11**). The air bags were generally rectangular and measured 183.0 cm (72.0 in) in length and 40.0 cm (15.7 in) in width. The forward aspect of the bags were attached to the A-pillar by tethers that measured 35.0 cm (13.7 in) in length; the rear aspect of the bags were attached to the D-pillar. The longitudinal area of coverage began near the A-pillar and extended to the D-pillar. The bag's vertical coverage began at the roof rail and extended to downward 5.0 cm (1.9 in) below the window frame. Portions of the left IC air bag had been cut away by unknown parties.

Event Data Recorder (EDR)

The CDR file information and system status at event for the first record reported the following:

- Three events were reported by the EDR.
- Two events were recovered: a locked frontal event and a locked side event.
- The time from event 1 to event 2 was 800 msec.
- The system reported a fault code of B1193-00 indicating the following. Crash Event Storage Full and Locked: No Sub Type Information . This Diagnostic Trouble Code (DTC) indicates the vehicle has been involved in a collision. Install a new Restraint Control Module (RCM) and impacts sensors.

The deployment data for the first record reported the following:

- The driver's frontal air bag first stage deployment time was 97.5 msec.
- The driver's frontal air bag second stage deployment time was 247.5 msec.
- The maximum longitudinal Delta-V was -35.73 km/h (-22.26 mph) at 250 msec.
- The maximum lateral Delta-V was 10.35 km/h (6.43 mph) at 138 msec.

The Pre-Crash data for the first record reported the following:

- The driver seat belt status was buckled and the seat track position was not forward.
- The front passenger seat belt status was not buckled.
- The vehicle speed was 105.0 km/h (65.2 mph) at 5 seconds prior to the event, accelerated to 113.0 km/h (70.2 mph) at 2.5 seconds, and decelerated to 28.0 km/h (17.4 mph) at 0 seconds.
- The accelerator was engaged 5 second prior to the event and was disengaged 2 second prior to the event when the brakes were engaged. At the same time as the brakes were engaged the ABS was also engaged and remained engaged throughout.
- The stability control remained non-engaged until 0.5 seconds, when it was engaged, and then returned to non-engaged at 0 seconds.

The system status at event for the second record reported the following:

- The number of events was 2.
- The time between event 1 and event 2 was 400 msec.

The deployment data for the second record reported the following:

- The driver side IC air bag deployment time and seat-mounted side air bag deployment times were each 45.0 msec.
- The driver pretensioner actuation time was 45.0 msec.
- The maximum longitudinal Delta-V was -4.39 km/h (-2.73) at 124 msec.
- The maximum lateral Delta-V was 3.76 km/h (2.34) at 92 msec.

Rollover Dynamics

The Ford was equipped with ABS, VSA, disc brakes, and front wheel drive. The Ford had a Static Stability Factor (SSF) of 1.43¹. The SSF of a vehicle is an at-rest calculation of its rollover resistance, based on geometric properties. Basically, SSR is a measure of the top-heavy characteristics of a vehicle. The Ford was a four-star rated vehicle, indicating that the vehicle has a 10% chance of rollover.

The Ford traveled over the embankment, vaulted, and began an end-over-end rollover about its longitudinal axis. The vehicle first impacted the ground with its front end; a gouge was located on the ground 22.5 m (74.0 ft) south of the initial impact. The vehicle then impacted the ground with its back end; a gouge was located 24.7 m (81.0 ft) south of the initial impact. The vehicle continued the end-over-end rollover three more turns before coming to rest on its roof near the private roadway. The distance from the initial impact to final rest was 38.7 m (127.0 ft).

OCCUPANT DEMOGRAPHICS

	Driver
Age/Sex:	48/Male
Seated Position:	Front left
Seat Type:	Bucket
Seat Track Position:	Full rearward
Height:	180 cm (71 in)
Weight:	79 kg (174 lbs)
Alcohol/Drug Involvement:	Alcohol. Had been drinking. Under influence.
Body Posture:	Unknown

¹www.safercar.gov

Hand Position: Unknown
 Foot Position: Right foot on brake, left on floorboard.
 Restraint Usage: Lap and shoulder belt used

Occupant Injuries

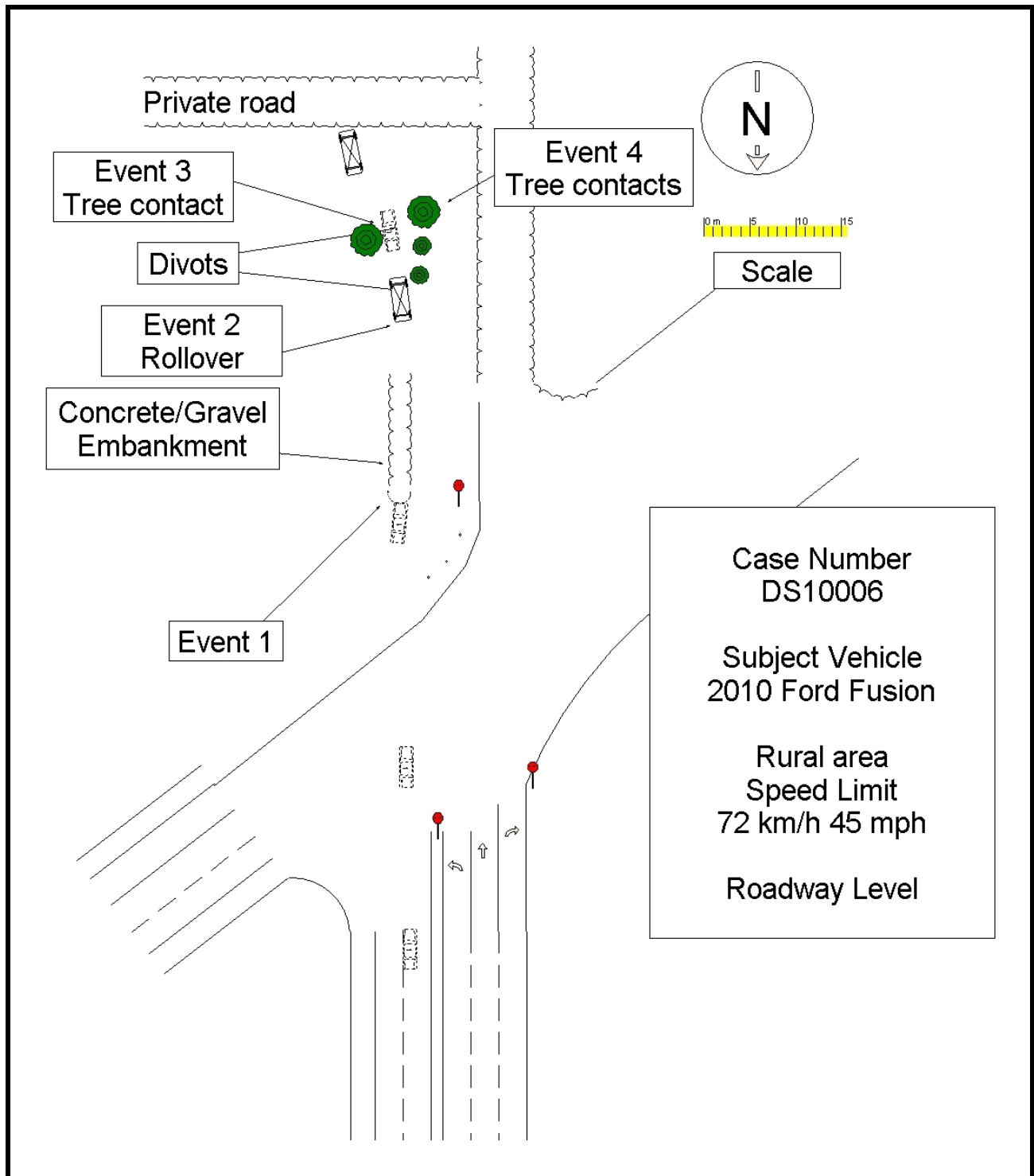
Driver: Injuries obtained from interviewee.

<u>Injury</u>	<u>Injury Severity</u> (AIS 2005)	<u>Injury Mechanism</u>	<u>Confidence Level</u>
Concussion	161000.1,0	Roof	Possible
Laceration, right lower leg, 2.5 cm (1 in)	810602.1,1	Lower instrument panel	Probable

Occupant Kinematics

The 48-year-old male driver was seated in an unknown posture. The driver reported that he was intoxicated and had passed out. He was wearing the lap and shoulder belt and the seat was in the rear-most track position. According to the EDR report, the driver was engaging the accelerator pedal and 2 seconds prior the impact the driver began braking. The driver was displaced forward slightly due to braking and then was displaced sharply forward during the impact the embankment. The driver loaded the pretensioned safety belt and the deployed frontal air bag. Both lower legs contacted the lower instrument panel and the driver sustained a laceration to the right lower leg. As the vehicle ramped up the embankment, the driver was forced downward into the seat cushion. The vehicle began an end-over-end rollover. During the first ground contact the driver was displaced in a forward direction and during the first back end/trunk contact was displaced upwards and rearwards and possibly contacted the interior roof surface with his head. The driver remained in his seat throughout the event and after the vehicle came to rest on its roof he was able extricate himself without assistance. He was transported to a local hospital where he was treated and released. He missed one day of work due to the crash.

Attachment 1. Scene Diagram



Attachment 2. Bosch Report

IMPORTANT NOTICE: Robert Bosch LLC and the manufacturers whose vehicles are accessible using the CDR System urge end users to use the latest production release of the Crash Data Retrieval system software when viewing, printing or exporting any retrieved data from within the CDR program. Using the latest version of the CDR software is the best way to ensure that retrieved data has been translated using the most current information provided by the manufacturers of the vehicles supported by this product.

CDR File Information

User Entered VIN	3FAHP0HAXAR*****
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	DS10006 WITHOUT VIN.CDR
Saved on	Thursday, March 4 2010 at 09:43:20 AM
Collected with CDR version	Crash Data Retrieval Tool 3.4
Reported with CDR version	Crash Data Retrieval Tool 3.4
EDR Device Type	airbag control module
ACM Adapter Detected During Download	No
Event(s) recovered	locked frontal event locked side event

Comments

No comments entered.

Data Limitations

The retrieval of this data has been authorized by the vehicle's owner, or other legal authority such as a subpoena or search warrant, as indicated by the CDR tool user on Thursday, March 4 2010 at 09:43:20 AM .

Restraints Control Module Recorded Crash Events:

Deployment Events cannot be overwritten or cleared from the Restraints Control Module (RCM). Once the RCM has deployed any airbag device, the RCM must be replaced. The data from events which did not qualify as deployable events can be overwritten by subsequent events. The RCM can store up to two deployment events.

Airbag Module Data Limitations:

- Restraints Control Module Recorded Vehicle Forward Velocity Change reflects the change in forward velocity that the sensing system experienced from the point of algorithm wake up. It is not the speed the vehicle was traveling before the event. Note that the vehicle speed is recorded separately five seconds prior to algorithm wake up. This data should be examined in conjunction with other available physical evidence from the vehicle and scene when assessing occupant or vehicle forward velocity change.
- Event Recording Complete will indicate if data from the recorded event has been fully written to the RCM memory or if it has been interrupted and not fully written.
- If power to the Airbag Module is lost during a crash event, all or part of the crash record may not be recorded.

Airbag Module Data Sources:

- Event recorded data are collected either INTERNALLY or EXTERNALLY to the RCM.
 - INTERNAL DATA is measured, calculated, and stored internally, sensors external to the RCM include the following:
 - > The Driver and Passenger Belt Switch Circuits are wired directly to the RCM.
 - > The Driver's Seat Track Position Switch Circuit is wired directly to the RCM.
 - > The Side Impact Sensors (if equipped) are located on the side of vehicle and are wired directly to the RCM.
 - > The Occupant Classification Sensor is located in the front passenger seat and transmits data directly to the RCM on high-speed CAN bus.
 - > Front Impact Sensors (right and left) are located at the front of vehicle and are wire directly to the RCM.
 - EXTERNAL DATA recorded by the RCM are data collected from the vehicle communication network from various sources such as Powertrain Control Module, Brake Module, etc.

02007_RCM-RC6_r001

System Status at Time of Retrieval

VIN as programmed into RCM at factory	3FAHP0HAXAR*****
Current VIN from PCM	3FAHP0HAXAR*****
Ignition cycle, download (first record)	160
Ignition cycle, download (second record)	160
Restraints Control Module Part Number	9E53-14B321-BK
Restraints Control Module Serial Number	3125897400000000
Restraints Control Module Software Part Number (Version)	9E53-14C028-AB
Left/Center Frontal Restraints Sensor Serial Number	122B4B7F
Left Side Restraint Sensor 1 Serial Number	122D0D8A
Left Side Restraint Sensor 2 Serial Number	122C4EB6
Right Frontal Restraints Sensor Serial Number	122BF316
Right Side Restraint Sensor 1 Serial Number	122B35A0
Right Side Restraints Sensor 2 Serial Number	122B10B5

System Status at Event (First Record)

Recording Status	Locked Record
Complete file recorded (yes,no)	Yes
Multi-event, number of events (1,2)	3
Time from event 1 to 2 (msec)	800
Lifetime Operating Timer at event time zero (seconds)	71,985
Key-on Timer at event time zero (seconds)	420
Vehicle voltage at time zero (Volts)	12.15
Energy Reserve Mode entered during event (Y/N)	No
Time Low-G Y RCM Sensor Lost Relative to Time Zero (msec)	Data lost prior to event
Time Low-G Z RCM Sensor Lost Relative to Time Zero (msec)	Data lost prior to event
Time RCM Angular Rate Sensor Lost Relative to Time Zero (msec)	Data lost prior to event
Time Driver Front Satellite Sensor Lost Relative to Time Zero (msec)	186.0
Time Passenger Front Satellite Sensor Lost Relative to Time Zero (msec)	70.5

Faults Present at Start of Event (First Record)

B1193-00

Deployment Data (First Record)

Frontal airbag deployment, time to first stage deployment, driver (msec)	97.5
Frontal airbag deployment, time to 2nd stage, driver (msec)	247.5
Maximum delta-V, longitudinal (MPH [km/h])	-22.20 [-35.73]
Time, maximum delta-V longitudinal (msec)	250
Maximum delta-V, lateral (MPH [km/h])	6.43 [10.35]
Time, maximum delta-V lateral (msec)	138
Left, forward, side satellite sensor discriminating deployment	Yes
Left or center front, satellite Sensor discriminating deployment	Yes
Left or center, front satellite Sensor safing	Yes
Right, front satellite sensor safing	Yes
RCM, front sensor discriminating deployment	Yes
RCM, front sensor safing	Yes

Pre-Crash Data -1 sec (First Record)

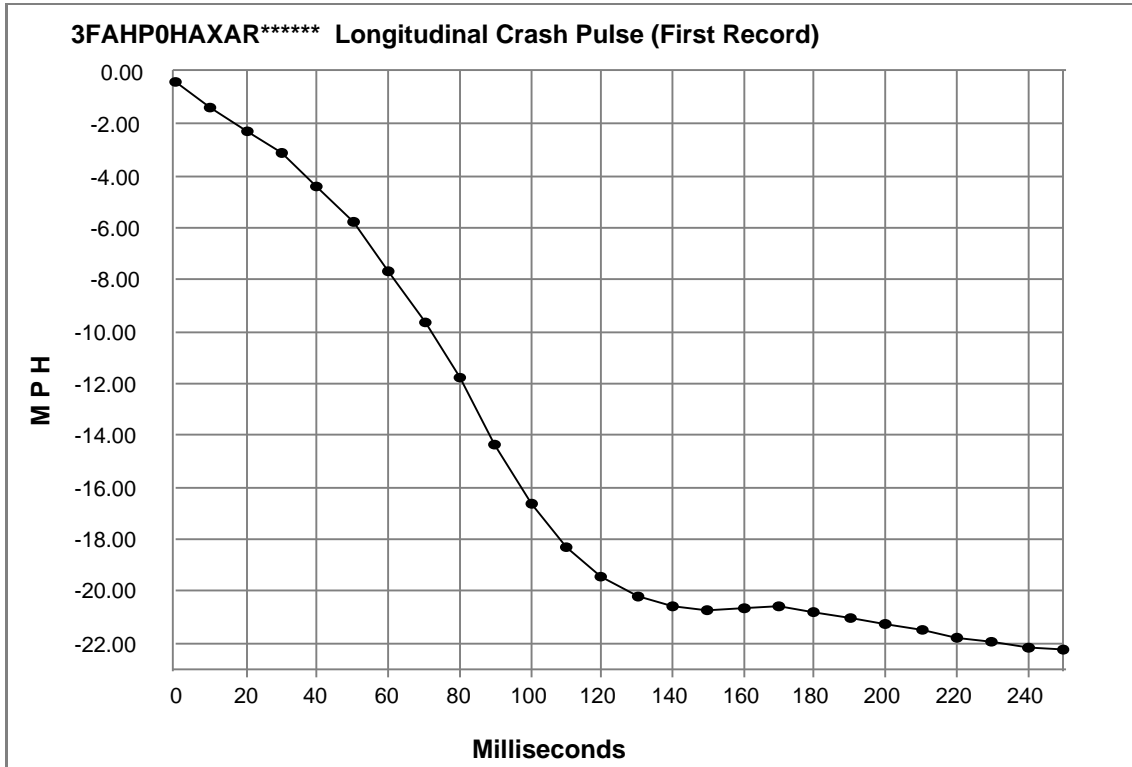
Ignition cycle, crash	150
Frontal air bag warning lamp, on/off	ON
Occupant size classification, front passenger (Child size Yes/No [Hex value])	No [\$01]
Frontal air bag suppression switch status, front passenger	N/A
Safety belt status, driver	Driver Buckled
Seat track position switch, foremost, status, driver	Not Forward
Safety belt status, front passenger	Passenger Not Buckled
Brake Telltale	Off
ABS Telltale	Off
Stability Control Telltale	Flashing 2 Hz
Speed Control Telltale	Off
Powertrain Wrench Telltale	Off
Powertrain Malfunction Indicator Lamp (MIL) Telltale	Off
HEV Hazard Telltale	Off

Pre-Crash Data -5 to 0 sec [2 samples/sec] (First Record)

Times (sec)	Speed vehicle indicated MPH [km/h]	Accelerator pedal, % full	Service brake, on/off	Engine rpm	ABS activity (engaged, non-engaged)	Stability control (engaged, non-engaged)	Traction Control via Brakes (engaged, non-engaged)	Traction Control via Engine (engaged, non-engaged)
- 5.0	65.2 [105.0]	61	OFF	3,800	non-engaged	non-engaged	non-engaged	non-engaged
- 4.5	65.9 [106.0]	61	OFF	3,900	non-engaged	non-engaged	non-engaged	non-engaged
- 4.0	67.1 [108.0]	61	OFF	4,000	non-engaged	non-engaged	non-engaged	non-engaged
- 3.5	67.7 [109.0]	61	OFF	4,000	non-engaged	non-engaged	non-engaged	non-engaged
- 3.0	69.0 [111.0]	61	OFF	4,100	non-engaged	non-engaged	non-engaged	non-engaged
- 2.5	69.6 [112.0]	61	OFF	4,100	non-engaged	non-engaged	non-engaged	non-engaged
- 2.0	70.2 [113.0]	0	ON	4,100	non-engaged	non-engaged	non-engaged	non-engaged
- 1.5	27.3 [44.0]	0	ON	3,300	engaged	non-engaged	non-engaged	non-engaged
- 1.0	49.7 [80.0]	0	ON	1,900	engaged	non-engaged	non-engaged	non-engaged
- 0.5	35.4 [57.0]	0	ON	1,100	engaged	engaged	non-engaged	non-engaged
0.0	17.4 [28.0]	0	ON	0	engaged	non-engaged	non-engaged	non-engaged

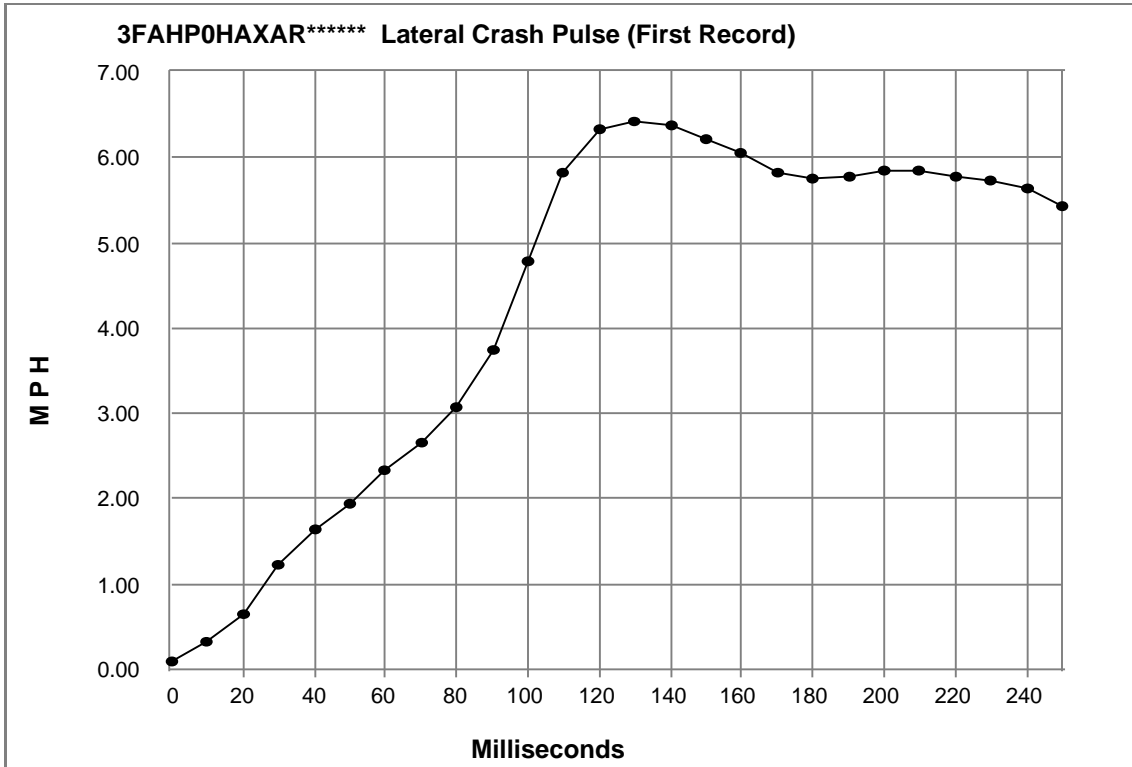
Pre-Crash Data -5 to 0 sec [10 samples/sec] (First Record)

Times (sec)	Steering Wheel Angle (degrees)	Stability Control Lateral Acceleration (g)	Stability Control Longitudinal Acceleration (g)	Stability Control Yaw Rate (deg/sec)
- 5.0	-501.4	-0.033	0.118	-0.12
- 4.9	-501.4	0.0	0.077	0.0
- 4.8	-501.5	-0.024	0.106	0.62
- 4.7	-501.4	-0.012	0.073	0.5
- 4.6	-501.4	-0.067	0.128	0.25
- 4.5	-501.4	-0.044	0.087	0.37
- 4.4	-501.4	-0.023	0.075	0.37
- 4.3	-501.4	-0.017	0.077	0.25
- 4.2	-501.5	-0.026	0.069	0.12
- 4.1	-501.7	-0.044	0.097	0.0
- 4.0	-501.7	-0.039	0.124	0.25
- 3.9	-501.6	-0.085	0.109	0.0
- 3.8	-501.5	-0.072	0.06	0.25
- 3.7	-501.6	-0.052	0.058	0.37
- 3.6	-501.6	-0.089	0.118	0.12
- 3.5	-501.6	-0.111	0.097	0.37
- 3.4	-501.7	-0.056	0.09	0.37
- 3.3	-501.7	-0.049	0.09	0.0
- 3.2	-501.8	-0.024	0.096	0.0
- 3.1	-501.8	-0.004	0.084	0.12
- 3.0	-501.8	-0.023	0.07	-0.25
- 2.9	-501.8	-0.059	0.08	-0.12
- 2.8	-501.8	0.001	0.1	0.0
- 2.7	-501.8	-0.028	0.105	0.25
- 2.6	-501.8	-0.039	0.102	-0.25
- 2.5	-501.8	-0.057	0.06	0.12
- 2.4	-501.9	-0.04	0.032	0.12
- 2.3	-502.3	-0.018	0.009	0.25
- 2.2	-502.8	-0.107	-0.122	-0.25
- 2.1	-503.6	-0.135	-0.709	-1.75
- 2.0	-503.6	-0.254	-0.415	-2.87
- 1.9	-504.1	-0.187	-0.251	-3.62
- 1.8	-505.5	-0.013	-0.176	-2.25
- 1.7	-507.7	0.255	-0.559	2.62
- 1.6	-513.0	-0.494	-0.296	-7.0
- 1.5	-521.0	-0.844	-0.745	-4.25
- 1.4	-522.8	-0.667	-0.988	-2.87
- 1.3	-524.7	0.713	-1.251	-9.37
- 1.2	-523.3	-2.0	-2.0	-10.75
- 1.1	-526.8	1.47	-2.0	-1.87
- 1.0	-511.8	0.999	-1.247	-26.37
- 0.9	-527.6	-0.172	-0.414	-21.37
- 0.8	-516.6	0.49	-1.006	-14.75
- 0.7	-506.4	-0.859	-2.0	37.87
- 0.6	-511.2	-0.28	0.14	40.62
- 0.5	-512.4	0.212	-0.467	36.0
- 0.4	-513.9	0.091	-0.177	32.0
- 0.3	-512.6	0.048	-0.173	28.12
- 0.2	Invalid	-0.008	-0.211	24.25
- 0.1	Invalid	-0.048	-0.168	20.87
0.0	Invalid	-0.083	-0.201	17.87



Longitudinal Crash Pulse (First Record)

Time (msec)	Delta-V, longitudinal (MPH)	Delta-V, longitudinal (km/h)
0	-0.37	-0.60
10	-1.34	-2.16
20	-2.24	-3.60
30	-3.12	-5.03
40	-4.38	-7.05
50	-5.78	-9.29
60	-7.63	-12.28
70	-9.67	-15.55
80	-11.76	-18.92
90	-14.36	-23.12
100	-16.64	-26.79
110	-18.28	-29.43
120	-19.46	-31.32
130	-20.22	-32.54
140	-20.59	-33.14
150	-20.73	-33.36
160	-20.61	-33.17
170	-20.58	-33.12
180	-20.80	-33.48
190	-21.03	-33.84
200	-21.29	-34.26
210	-21.50	-34.60
220	-21.77	-35.04
230	-21.95	-35.32
240	-22.14	-35.63
250	-22.26	-35.82



Lateral Crash Pulse (First Record)

Time (msec)	Delta-V, lateral (MPH)	Delta-V, lateral (km/h)
0	0.10	0.16
10	0.33	0.52
20	0.64	1.04
30	1.23	1.98
40	1.64	2.64
50	1.93	3.11
60	2.34	3.76
70	2.65	4.26
80	3.07	4.93
90	3.75	6.03
100	4.79	7.71
110	5.81	9.35
120	6.32	10.17
130	6.42	10.33
140	6.38	10.27
150	6.22	10.01
160	6.05	9.73
170	5.83	9.38
180	5.76	9.26
190	5.78	9.30
200	5.84	9.40
210	5.84	9.40
220	5.78	9.30
230	5.73	9.22
240	5.63	9.06
250	5.43	8.74

System Status at Event (Second Record)

Recording Status	Locked Record
Complete file recorded (yes,no)	Yes
Multi-event, number of events (1,2)	2
Time from event 1 to 2 (msec)	400
Lifetime Operating Timer at event time zero (seconds)	71,985
Key-on Timer at event time zero (seconds)	420
Vehicle voltage at time zero (Volts)	13.446
Energy Reserve Mode entered during event (Y/N)	No
Time Low-G Y RCM Sensor Lost Relative to Time Zero (msec)	Data lost prior to event
Time Low-G Z RCM Sensor Lost Relative to Time Zero (msec)	Data lost prior to event
Time RCM Angular Rate Sensor Lost Relative to Time Zero (msec)	Data lost prior to event

Faults Present at Start of Event (Second Record)

No Faults Recorded

Deployment Data (Second Record)

Side curtain airbag deployment, time to deploy, driver side (msec)	45.0
Side (thorax) air bag deployment, time to deploy, driver (msec)	45.0
Frontal pretensioner (retractor) deployment, time to fire, driver (msec)	45.0
Maximum delta-V, longitudinal (MPH [km/h])	-2.73 [-4.39]
Time, maximum delta-V longitudinal (msec)	124
Maximum delta-V, lateral (MPH [km/h])	2.34 [3.76]
Time, maximum delta-V lateral (msec)	92
Left, forward, side satellite sensor discriminating deployment	Yes
Left, forward, side satellite sensor safing	Yes
Left, rear, side satellite sensor safing	Yes
RCM, side left sensor safing	Yes
RCM, side right sensor safing	Yes

Pre-Crash Data -1 sec (Second Record)

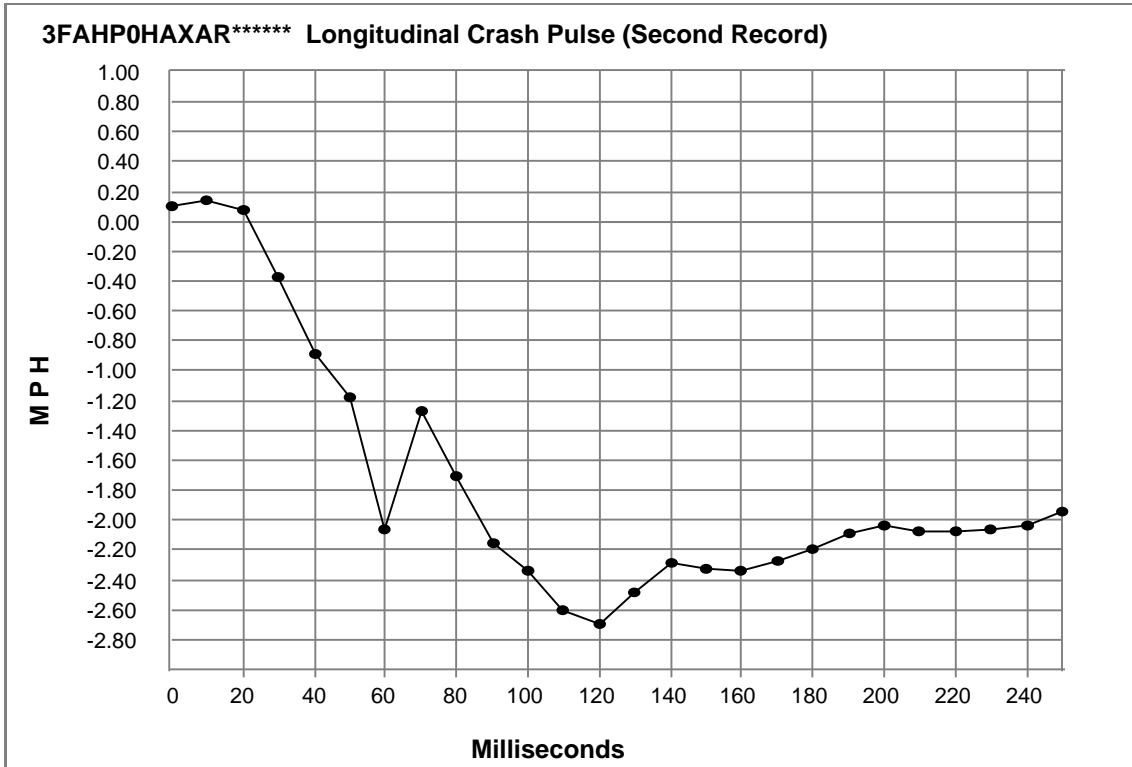
Ignition cycle, crash	150
Frontal air bag warning lamp, on/off	OFF
Occupant size classification, front passenger (Child size Yes/No [Hex value])	No [\$01]
Frontal air bag suppression switch status, front passenger	N/A
Safety belt status, driver	Driver Buckled
Seat track position switch, foremost, status, driver	Not Forward
Safety belt status, front passenger	Passenger Not Buckled
Brake Telltale	Off
ABS Telltale	Off
Stability Control Telltale	Off
Speed Control Telltale	Off
Powertrain Wrench Telltale	Off
Powertrain Malfunction Indicator Lamp (MIL) Telltale	Off
HEV Hazard Telltale	Off

Pre-Crash Data -5 to 0 sec [2 samples/sec] (Second Record)

Times (sec)	Speed vehicle indicated MPH [km/h]	Accelerator pedal, % full	Service brake, on/off	Engine rpm	ABS activity (engaged, non-engaged)	Stability control (engaged, non-engaged)	Traction Control via Brakes (engaged, non-engaged)	Traction Control via Engine (engaged, non-engaged)
- 5.0	62.8 [101.0]	61	OFF	3,700	non-engaged	non-engaged	non-engaged	non-engaged
- 4.5	64.0 [103.0]	61	OFF	3,800	non-engaged	non-engaged	non-engaged	non-engaged
- 4.0	65.2 [105.0]	61	OFF	3,800	non-engaged	non-engaged	non-engaged	non-engaged
- 3.5	65.9 [106.0]	61	OFF	3,900	non-engaged	non-engaged	non-engaged	non-engaged
- 3.0	67.1 [108.0]	61	OFF	4,000	non-engaged	non-engaged	non-engaged	non-engaged
- 2.5	67.7 [109.0]	61	OFF	4,000	non-engaged	non-engaged	non-engaged	non-engaged
- 2.0	69.0 [111.0]	61	OFF	4,100	non-engaged	non-engaged	non-engaged	non-engaged
- 1.5	69.6 [112.0]	61	OFF	4,100	non-engaged	non-engaged	non-engaged	non-engaged
- 1.0	70.2 [113.0]	0	ON	4,100	non-engaged	non-engaged	non-engaged	non-engaged
- 0.5	27.3 [44.0]	0	ON	3,300	engaged	non-engaged	non-engaged	non-engaged
0.0	49.7 [80.0]	0	ON	1,900	engaged	non-engaged	non-engaged	non-engaged

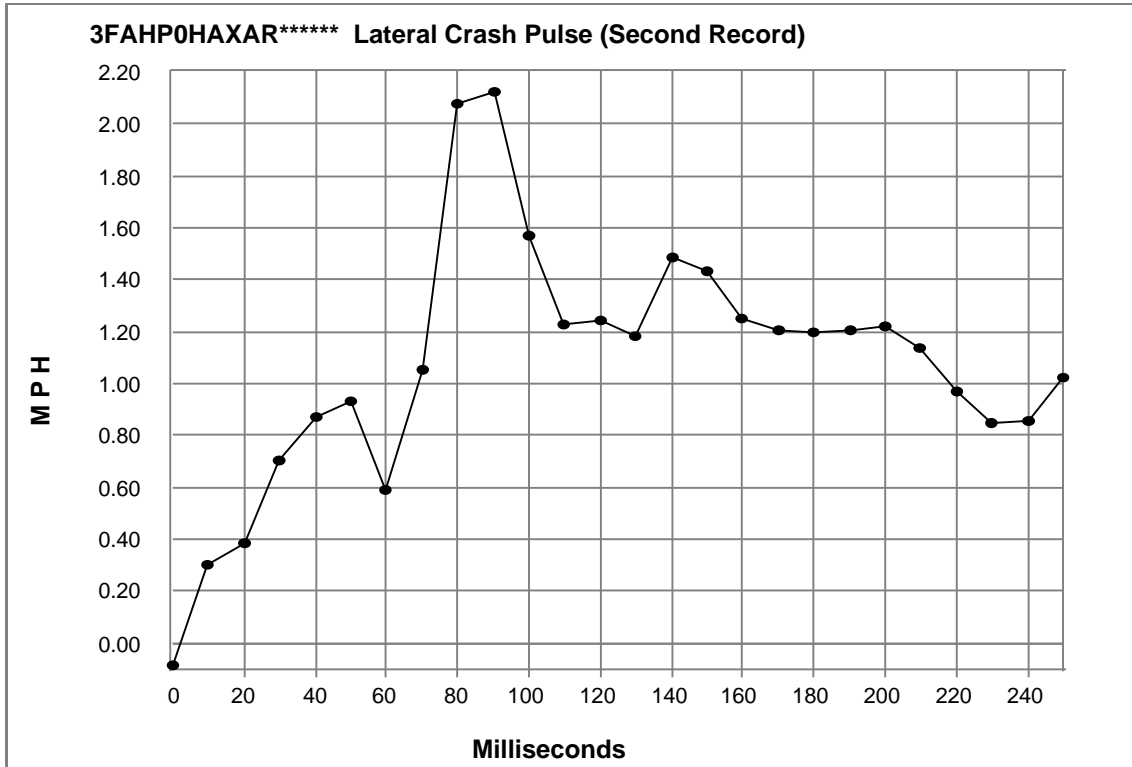
Pre-Crash Data -5 to 0 sec [10 samples/sec] (Second Record)

Times (sec)	Steering Wheel Angle (degrees)	Stability Control Lateral Acceleration (g)	Stability Control Longitudinal Acceleration (g)	Stability Control Yaw Rate (deg/sec)
- 5.0	-501.7	-0.047	0.091	-0.12
- 4.9	-501.7	-0.026	0.087	0.12
- 4.8	-501.7	-0.042	0.091	0.0
- 4.7	-501.7	0.008	0.097	0.5
- 4.6	-501.7	-0.017	0.078	0.37
- 4.5	-501.5	-0.027	0.091	0.0
- 4.4	-501.5	-0.018	0.073	0.37
- 4.3	-501.2	-0.047	0.131	0.5
- 4.2	-501.3	-0.064	0.08	0.75
- 4.1	-501.4	-0.033	0.118	-0.12
- 4.0	-501.4	0.0	0.077	0.0
- 3.9	-501.5	-0.024	0.106	0.62
- 3.8	-501.4	-0.012	0.073	0.5
- 3.7	-501.4	-0.067	0.128	0.25
- 3.6	-501.4	-0.044	0.087	0.37
- 3.5	-501.4	-0.023	0.075	0.37
- 3.4	-501.4	-0.017	0.077	0.25
- 3.3	-501.5	-0.026	0.069	0.12
- 3.2	-501.7	-0.044	0.097	0.0
- 3.1	-501.7	-0.039	0.124	0.25
- 3.0	-501.6	-0.085	0.109	0.0
- 2.9	-501.5	-0.072	0.06	0.25
- 2.8	-501.6	-0.052	0.058	0.37
- 2.7	-501.6	-0.089	0.118	0.12
- 2.6	-501.6	-0.111	0.097	0.37
- 2.5	-501.7	-0.056	0.09	0.37
- 2.4	-501.7	-0.049	0.09	0.0
- 2.3	-501.8	-0.024	0.096	0.0
- 2.2	-501.8	-0.004	0.084	0.12
- 2.1	-501.8	-0.023	0.07	-0.25
- 2.0	-501.8	-0.059	0.08	-0.12
- 1.9	-501.8	0.001	0.1	0.0
- 1.8	-501.8	-0.028	0.105	0.25
- 1.7	-501.8	-0.039	0.102	-0.25
- 1.6	-501.8	-0.057	0.06	0.12
- 1.5	-501.9	-0.04	0.032	0.12
- 1.4	-502.3	-0.018	0.009	0.25
- 1.3	-502.8	-0.107	-0.122	-0.25
- 1.2	-503.6	-0.135	-0.709	-1.75
- 1.1	-503.6	-0.254	-0.415	-2.87
- 1.0	-504.1	-0.187	-0.251	-3.62
- 0.9	-505.5	-0.013	-0.176	-2.25
- 0.8	-507.7	0.255	-0.559	2.62
- 0.7	-513.0	-0.494	-0.296	-7.0
- 0.6	-521.0	-0.844	-0.745	-4.25
- 0.5	-522.8	-0.667	-0.988	-2.87
- 0.4	-524.7	0.713	-1.251	-9.37
- 0.3	-523.3	-2.0	-2.0	-10.75
- 0.2	-526.8	1.47	-2.0	-1.87
- 0.1	-511.8	0.999	-1.247	-26.37
0.0	-527.6	-0.172	-0.414	-21.37



Longitudinal Crash Pulse (Second Record)

Time (msec)	Delta-V, longitudinal (MPH)	Delta-V, longitudinal (km/h)
0	0.10	0.16
10	0.14	0.22
20	0.07	0.12
30	-0.37	-0.59
40	-0.89	-1.43
50	-1.17	-1.89
60	-2.07	-3.33
70	-1.27	-2.05
80	-1.71	-2.75
90	-2.16	-3.48
100	-2.34	-3.77
110	-2.60	-4.19
120	-2.69	-4.33
130	-2.49	-4.01
140	-2.29	-3.69
150	-2.33	-3.75
160	-2.34	-3.77
170	-2.28	-3.67
180	-2.19	-3.53
190	-2.08	-3.35
200	-2.04	-3.29
210	-2.07	-3.34
220	-2.08	-3.35
230	-2.06	-3.31
240	-2.04	-3.28
250	-1.94	-3.13



Lateral Crash Pulse (Second Record)

Time (msec)	Delta-V, lateral (MPH)	Delta-V, lateral (km/h)
0	-0.08	-0.14
10	0.30	0.49
20	0.39	0.62
30	0.70	1.13
40	0.87	1.41
50	0.93	1.50
60	0.59	0.96
70	1.05	1.69
80	2.08	3.35
90	2.12	3.42
100	1.57	2.53
110	1.23	1.98
120	1.24	2.00
130	1.18	1.90
140	1.49	2.39
150	1.43	2.31
160	1.25	2.01
170	1.21	1.94
180	1.20	1.93
190	1.21	1.94
200	1.22	1.96
210	1.14	1.83
220	0.97	1.56
230	0.85	1.36
240	0.86	1.38
250	1.03	1.65